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Bibliographic data: JP 2005510789 (T)

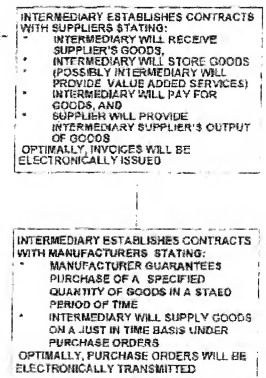
METHOD AND APPARATUS FOR MANAGEMENT, FINANCING AND SUPPLY IN AN INTEGRATED SUPPLY CHAIN SYSTEM

Publication date:	2005-04-21	
Inventor(s):		
Applicant(s):		
Classification:	- international:	***G06Q10/00; G06Q20/00; G06Q30/00; G06Q40/00; G06Q50/00;*** (IPC1-7): G06F17/60
	- European:	G06Q10/00E
Application number:	JP20030548050T 20021128	
Priority number (s):	AU20010100598 20011128; WO2002SG00278 20021128	
Also published as:	• JP 4677188 (B2) • WO 03046681 (A2) • WO 03046681 (A3) • US 2005131785 (A1) • MX PA04005187 (A) • more	

Abstract not available for JP 2005510789 (T)

Abstract of corresponding document: WO 03046681 (A2)

A method and apparatus for providing trade financing to inventory suppliers, manufacturers, or both, on the basis of a zero inventory model. The method and apparatus involves the generation of a security on the basis of inventory ownership combined with either or both of a purchase guarantee from an inventory purchaser and an assignment of accounts receivable by an inventory supplier. The invention also involves an integrated supply chain process and event notification interface that can perform financial transactions and electronic proof of delivery in support of such zero inventory model financing.



Last updated: 26.04.2011 Worldwide Database 5.7.22; 93p

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Translate this text

<Desc/Clms Page number 1>

METHOD AND APPARATUS FOR MANAGEMENT, FINANCING AND
SUPPLY IN AN INTEGRATED SUPPLY CHAIN SYSTEM
FIELD OF THE INVENTION [01] The present invention relates to a method and apparatus for providing trade financing to inventory suppliers, manufacturers, or both, within an integrated supply chain system. The present invention further relates to a process and event notification interface that can perform financial transactions and electronic proof of delivery.

BACKGROUND OF THE INVENTION [02] The introduction of supply chain management (SCM) has revolutionized the ability of businesses to control and regulate the flow of inventory and to smooth the flow of inventory from inventory suppliers to manufacturers.

Optimization of financial performance is possible since SCM can reduce inventory stock levels to the minimum that is then required for the manufacturer. In achieving such optimization, valuable capital can be freed up for the operation of the business, instead of being tied up to buffer excessive inventory levels. Integration into SCM of various operational and physical aspects of a business is a key to achieving the best managed flow of inventory, while at the same time minimizing the financial impact of holding inventory for the business.

[03] However. one of the key problems encountered in SCM is the multi- tier process of successive ownership transfer from one inventory supplier to another, whether or not additional value is added. Even though the inventory eventually ends up with the manufacturer, it is accompanied by a rather high mark-up on top of the original value of the inventory plus value added, due to such a multi-tier ownership process.

[04] Despite such increased costs. manufactures do not wish to hold inventory for an excessive time period, since it will reduce the amount of free capital available to them, increase their direct storage and warehousing costs, and generally restrict the manufacturer's ability to optimise inventory management.

[05] Currently, there are two prevailing financing models used in SCM and the logistics industry in general, Supplier Owned Inventory (SOI) and Manufacturer

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Owned Inventory (MOI), with several variations also existing, such as VMI, (Vendor
Managed Inventory). These (VMI, SOI) are solutions made to ensure that manufacturers do not hold inventory until they require such inventory for actual manufacturing.

[06] While these models solve problems of manufacturers, they create problems for the inventory suppliers, who become laden with the obligation of holding such inventory in their accounting books. As a result, the inventory supplier must now find trade financing from a financial institution. However, the inventory supplier faces significant limitations in obtaining favorable terms for such financing, both as to rate and loan amount.

[07] Typically, a supplier of goods will strive to operate on a cash-on- delivery or cash-on-purchase order basis in an ideal environment. However, notwithstanding the advantages of modern commercial practices, such as are provided by B2B and B2C systems and techniques, two basic financing approaches still are used. "accounts receivable financing"and"inventory financing." [08] In current"accounts receivable financing" (AR financing) practices, for example, a supplier may sell $1, 000,000 worth of computer hard-drives to a manufacturer of computer systems, and provide a credit term of 60 days to the manufacturer. The manufacturer, being a $20 billion conglomerate, with credit ratings that may exceed those of third world countries, can provide the supplier recourse. The supplier then offers its sale receipts or invoices to a financier for immediate payment of the sale value, less a discount that the financier will charge the supplier. The rate of discount depends on the credit rating of the manufacturer At the end of the 60 days, the financier will receive the full payment ($ 1, 000.000) from the manufacturer. The above method uses financial instruments such as commercial notes.

[09] The alternative"inventory financing"method involves the supplier pledging the ownership or title of goods of a certain value to the financier. in return for operating cash. This may be favorable in the case where the supplier may be selling goods that have a very short turnover time (time of inventory to time of sale to customer). For example, an oil trader may

have on hand $1, 000,000 worth of crude oil that is typically sold within a 7-day period to a variety of customers. The oil trader

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may need money for the transport of the oil to the various customers in a multitude of destination countries. In effect, the oil trader will"mortgage"the oil inventory to the financier for cash. The rate and schedule of charges that the financier will impose on the supplier depends on the quality of the pledged inventory. Oil is a commodity with a generally short-term price stability, and a long-term market. On the other hand, semiconductor chips have neither price stability nor long term market value. Thus, a financier would not release $1,000, 000 to a supplier of DRAM chips for a 60-day period, when the prices of DRAM chips may be 30% down in a period of 10 days.

[10] It also is quite rare, if not impossible, for a bank to accept inventory that the customer does not own (because it has sold them in exchange for accounts receivables) as collateral for a loan. Thus, where there is a need for financing for $1 million worth of inventory, but half is already sold, and the other half is allocated for sale due to a third party arrangement with the customer, such as a conditional purchase forecast (common in the industry), inventory financing is limited. A bank will simply finance $500,000 at best. In the case where half is allocated for sale, but there is no existing sale invoice from the customer, since the customer only has a conditional forecast that the other half of the inventory may be sold to one or more manufacturers within a period, the bank would not finance the remaining $500,000 of inventory. In short, the inventory supplier can not make use of inventory sold to customers as collateral to obtain a lower cost of financing.

[11] There are further differences between the case where a customer simply pledges accounts receivables and the case where there is inventory financing.

For example, the bank may offer different rates based on different collateral being pledged by the customer (inventory may be financed at 8% pa. up to 50% of the value of inventory, while accounts receivables may be financed at 6% pa. up to 80% of the value of account receivables).

[12] Thus, there is a clear need to find a way to optimize the use of inventory ownership and/or control so that the most favorable financing terms can be achieved, yet quick payment to supplies and just in time delivery to manufacturers can be attained as well. The present invention satisfies such need, including but not limited to offering the inventory supplier a single low rate of financing.

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[13] The financing requirements of the manufacturer and inventory supplier are further amplified by the way certain physical processes in the logistics chain are separated from current electronic SCM systems, particularly certain financial processes that are crucial in the entire SCM process. One such financial process is inventory financing.

[14] Existing SCM electronic systems are built and operated with emphasis on operations and processes directly related to supply chain management. However, there is no"real"or direct integration of financial processes commonly required by the inventory supplier, manufacturer, or both, such as inventory financing etc.

Currently, "integrated"supply chain systems are ones that are capable of merging supply chain data and generating invoices, purchase orders, or electronic documents related to shipping and handling etc. The problem arising from such"integrated systems"is the lack of true physical integration of certain process into the supply chain, such as the delivery of inventory from the supply chain intermediary to the inventory purchaser, typically the manufacturer. When the inventory is physically delivered, and possession, ownership and/or control handled over to the inventory purchaser, the purchaser will typically sign on an invoice receipt, commonly deemed as a"proof-of-delivery". The invoice receipt will then be routed back to a human operator running the supply chain system, who will manually update related information in the system database, and thus start the financial process (i. e. , payment) related to such a delivery. Clearly, this adds cost to the overall process and is generally not efficient. Moreover, there may be inaccuracies and delays in recording and communicating the related events or activities, since the physical activities (such as the delivery and handing over of inventory) are not electronically connected to the supply chain management system.

[15] Clearly, there is a need for the supply chain processes to be capable of sending system information on the status of each process and/or event, and to be able to automatically trigger other related activities and SCM processes. The goal is to dramatically improve the overall efficiency of the supply chain management system and provide the supply chain intermediary with the ability to perform and complete services accurately and in the least amount of time.

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SUMMARY OF THE INVENTION [16] The present invention concerns a zero inventory model for financing the production, sale, storage and delivery of goods in a supply chain having just in time capability. The invention further concerns a supply chain system for implementing such zero inventory model, including rapid and efficient event notification and the provision of electronic proof-of-delivery.

[17] In traditional financing, the inventory supplier can raise money from the pledging of sale receipts to the financier. In zero inventory model (ZIMTM) financing, the supply chain intermediary secures title and/or control of inventory and combines such asset with purchase guarantees and/or assigned accounts receivable to securitize the financing.

[18] In one exemplary embodiment of the present invention, the supply chain intermediary owns the inventory and secures the purchase guarantee from the subsequent purchaser of the inventory. In another exemplary embodiment, the supply

chain intermediary also owns the inventory but secures an assignment of accounts receivable from the supplier. In both embodiments, the supply chain intermediary is in possession of two different assets, and uses that combination to create a negotiable bankable instrument that can be used for asset securitization and subsequently funding. This method creates a very safe security for the supply chain intermediary to obtain a very low cost of financing. The inventory supplier does not need to present sale receipts or collateral to the supply chain intermediary to get a shorter payment cycle. This is because the supply chain intermediary has taken the role of securing the purchase guarantee from the manufacturer, while at the same time holding ownership to the inventory that is tied to such a guarantee. Alternatively, the supply chain intermediary has combined an assignment of account receivables from the supplier, while at the same time holding ownership and control of the inventory that is tied to the account receivable.

[19] The only party that is physically and financially positioned to offer such safe security is the supply chain intermediary, since inventory is physically delivered in succession from the supplier to the manufacturer. Zero inventory model (ZIMTM) financing, in one exemplary embodiment, is a method whereby the supply chain intermediary secures a purchase guarantee from the manufacturer or assignment

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of accounts receivable from the supplier, and ownership of inventory from the supplier, attaches the two instruments into a single security for a financier to provide a very low cost of financing to the supplier, manufacturer or both. This satisfies the requirements of two parties involved in the supply chain. First, the supplier gets a shorter payment cycle at a lower rate. Second, an inventory purchaser (e. g. , a manufacturer) can receive the benefit of just-in-time access to inventory.

[20] Each financial process (to make payment available for the inventory) may be any kind of arrangement that the intermediary may implement with any other third party such as a financial service provider. Significantly, the two financing methods do not involve a brokering model, since the supply chain intermediary takes physical ownership and/or control of the inventory prior to the provision of the inventory to the manufacturers.

[21] The possession and control of the inventory by the supply chain intermediary permits the intermediary at the request of the inventory supplier, the manufacturer, or both, to perform additional value-adding actions or steps to the physical inventory. For example, the manufacturer may require a supplier of computer display devices to label such devices with a sticker label of the manufacturer, before the manufacturer purchases the devices from the supplier.

Because the supplier is usually an OEM (original equipment manufacturer) of the device, under conventional arrangements, labeling of such devices may require yet another third party to perform the additional steps (plus contracting, delivering and receiving activity) Very often, such a device is labeled and then handled over to the supply chain intermediary for storage management. The supply chain intermediary can easily provide the additional labeling service for the supplier, since the inventory (of such devices) will ultimately be handed over to the intermediary anyway.

[22] The inventory supplier will also face the issue of getting paid for the devices supplied to the manufacturer after a stipulated time (credit period). The supply chain intermediary, should it perform similar services to a multitude of suppliers, can consolidate the financing requirement of the collective group of suppliers and provide a shorter payment cycle. At the same time, the intermediary can implement additional value added services, including manufacturing or assembly processes for the suppliers.

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[23] This two-into-one service provision to the suppliers can dramatically improve the entire supply chain process, as the amount of physical transfer and ownership transfer is reduced. For example, there is no need to ship the devices from supplier to a labeling company, and then to the supply chain intermediary. The vital role that the supply chain intermediary plays with respect to the manufacturer, inventory supplier or both is its ability to undertake processes to physically enhance or prepare the inventory for subsequent processes along such a supply chain.

[24] Since the supply chain process contemplates that the supply chain intermediary will take ownership and/or control of the inventory, the supply chain intermediary will have the ability to make use of its own internal financing sources to raise funds to implement the actions or steps required to perform this"value-added" service. Financing to the inventory suppliers, the manufacturers, or both, becomes a favorable process that can reduce the cost of financing for the inventory supplier, the manufacturer, or both. This is because the supply chain intermediary is able to make use of the collective store of inventory from a plurality of inventory suppliers to secure a much lower cost of funds than that available through the individual financing efforts of each inventory supplier.

[25] This supply chain arrangement is desirable for the supply chain intermediary as well, since its ownership and/or control of the inventory allows the intermediary to also easily perform additional"value-added"services that the manufacturers demand from the inventory suppliers.

[26] The foregoing financing methods take advantage of the requirement of the manufacturers, and/or inventory suppliers to provide another useful service to both entities.

[27] In another preferred embodiment, the supply chain intermediary may also undertake to perform the additional steps while a third party implements financing to the inventory supplier, manufacturer, or both, similar to methods described in the first exemplary embodiment.

[28] The present invention can also electronically broadcast messages, data and/or information relating to a particular or a series of supply chain processes or events, to a plurality of mobile devices such as a mobile phone, mobile computer etc.

The system can require that several conditions or parameters must be met prior to the

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electronic broadcasting of the messages. For example, the system can monitor the quantity of current inventory, and once such inventory meets certain pre-stored conditions, trigger the system to broadcast a message to a pre-determined device. The invention can also allow for different type of devices to be notified of the message, depending on the conditions set on the system. Preferably, the invention can send a simple email message, if the condition set by the system is not an urgent (or time sensitive) notification ! Preferably, the invention can send the message to a mobile phone if the inventory under monitoring falls within a condition that warrants immediate attention. Thus, the invention provides a unique system whereby conditions of each supply chain process can be programmed into the system, and the conditions can provide the users of the system the ability to determine the urgency of each condition, and to broadcast the message to a specific device, including but not limited to mobile phones, mobile computers, personal digital assistants etc.

[29] The present invention can also allow the supply chain intermediary to electronically initiate a mobile device (that had pre-registered with the supply chain system of the supply chain intermediary) owned by the manufacturer, to input a password or PIN and electronically validate a transaction, approve the delivery of inventory at hand, and at the same time, via the mobile device, instruct payment instructions to be made from the manufacturer to the pre-determined bank account of the supply chain intermediary. This electronic method to validate a"proof-of- delivery" (ePOD) between the supply chain intermediary and the manufacturer, and also integrates the financial processes (in this case the direct payment instructions from the inventory purchaser to the supply chain intermediary) alongside the supply chain process. A dramatic increase in efficiency and speed in such a transaction is achieved since two processes are simultaneously performed at the time when such a process is taking place, or has already been finished (such as the delivery and handing over of inventory to the manufacturer). In addition, this electronic ePOD can also initiate the transfer of ownership of the inventory from the supply chain intermediary to the manufacturer. Mobile devices or dedicated computer units are also attached to the various components of a supply chain electronic system operated by the supply chain intermediary.

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BRIEF DESCRIPTION OF THE DRAWINGS [30] In order that the invention may be more clearly ascertained, preferred embodiments will now be described, by way of example, with reference to the accompanying drawings, in which: [31] Figure 1A is a flow chart illustrating the basic steps for zero inventory method financing where securitization of financing is based on goods in inventory and acquired purchase guarantees from a manufacturer; [32] Figure 1B is a flow chart illustrating the basic steps for zero inventory method financing where securitization of financing is based on goods in inventory and an assignment of accounts receivable from a supplier; [33] Figure 2A is a schematic view of a portion of the transactions in a system implementing zero inventory method financing, where a supply chain intermediary takes ownership of inventory from one or more inventory suppliers and provides the inventory suppliers with a cash payment or advance based upon specific supply chain processes; [34] Figure 2B is a schematic view of a portion of the transactions in a system implementing zero inventory method financing, where a manufacturer requests from the supply chain intermediary ownership of inventory either in incremental quantities or its entire quantity, with the manufacturer effecting payment, for example, on the ePOD communications unit, and providing a purchase guarantee; [35] Figure 2C is a schematic view of a portion of the transactions in a system implementing zero inventory method financing, where a supply chain intermediary takes ownership of inventory from one or more inventory suppliers as well as an assignment of accounts receivable, and provides the inventory suppliers with a cash payment or advance based upon specific supply chain processes; [36] Figure 3A is a schematic view of a system arrangement for zero inventory method financing, which supports the electronic broadcast and alert of a pre-determined plurality of mobile devices when certain supply chain processes and/or events trigger the system, according to an exemplary embodiment of the present invention; and

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[37] Figure 3B is a schematic view of a portion of the system arrangement for zero inventory method financing, which illustrates a mobile device sending electronic data and authentication data input from the user to the mobile communications unit, and upon successful user authentication, routing of electronic data to a financial interface module for implementation of financial processes with a financial institution.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS [38] In order that the invention may be more clearly ascertained, exemplary and preferred embodiments, are subsequently described that, by way of example and with reference to the accompanying drawings, provide an enabling description of the invention. These exemplary embodiments are not intended to be limiting, but to provide some examples of the manner in which the invention may be made and used.

One skilled in the art would be enabled to make and use the invention according to other embodiments based upon these teachings, and such additional embodiments are within the scope of the present invention.

[39] In a typical scenario for implementing zero inventory (ZIMTM) financing, at least three of the following four parties would be involved: a supply chain intermediary; an inventory supplier; a manufacturer; and a financier.

[40] Typically, the"supply chain intermediary, "or"service provider"is the operator of the technology behind ZIMTM financing, and may comprise one or more parties. At a minimum, the intermediary would (1) supply the actual operational services involved in ZIMTM financing and (2) operate and implement the contractual and data processing aspects of ZIMTM financing. Preferably, these two functions would be performed by separate, although related, entities.

[41] The"financier"will be the entity that evaluates the credit ranking and financial considerations of a typical ZIMTM

transaction, and makes use of securities that may be provided by the supply chain intermediary to procure financing for the intermediary.

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[42] The"inventory supplier"is the ZIMTM service consumer who provides the inventory and has an immediate requirement for a shorter payment cycle, comparatively lower transaction cost and lower interest rate, as compared to those available from conventional financing products, such as account receivable financing and inventory financing.

[43] The"manufacturer"or other"inventory purchaser"is a ZIMTM service consumer who desires to purchase inventory, but has an immediate requirement for deferred delivery and ownership of inventory, usually on a just-in-time basis, from the supplier.

[44] In either AR financing or inventory financing, there is usually a base cost attached to the risk that is being perceived by the financier. The riskier the deal. the higher the charges, or in many cases, the financier will not even consider funding the supplier.

[45] However, if the supplier can finance the sale (for $1,000, 000 worth of hard-drives) via a sale invoice and collateral of the inventory (the hard-drives), the risk level is significantly decreased, and so is the cost of financing. This scenario is akin to the supplier selling the hard-drives to the manufacturer, selling the invoices to get financing and asking the manufacturer to pledge the inventory to the financier. In this example the manufacturer is a computer notebook maker. with a multitude of suppliers for the various components required for the manufacture and assembly of the notebook. It will be understood. however, that the manufacturer could be a producer of essentially any goods.

[46] A single supplier of such components. who will be referred to as the "inventory supplier, "will be described, however, it will also be understood that a manufacturer could obtain components from a plurality of such suppliers. The supplier supplies computer hard-drives to the manufacturer, using the supply chain intermediary as the supply chain manager. The manufacturer currently only wishes to hold inventory (of the hard-drives) that is adequate for the actual current manufacturing requirements. The supplier, however, will only sell the inventory in a specific wholesale quantity. As a result, the supplier will usually own the entire value of the inventory until the manufacturer actually purchases the inventory.

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[47] The supplier complies with the manufacturer's wish by finding a source for financing. Conventionally, the supplier will pledge the inventory as collateral to the intermediary (inventory financing), or obtain financing from the sale receipts of the inventory from the manufacturer (accounts receivable financing).

[48] In the case of inventory financing, inventory that is pledged to the intermediary will be discounted by the intermediary by a certain percentage, for example, computer hard-drives may be discounted by 15% for a financing period of 60 days. The supplier may have $1, 000,000 worth of hard-drives in actual inventory - and therefore will perhaps obtain only US$850,000 in financing. This is due to the existence of a possibility of obsolescence of the inventory. The intermediary may also charge the supplier an interest rate of about 7% per annum.

[49] In the financing method of pledging sale receipts (accounts receivable financing), the financier will evaluate the credit worthiness of the supplier's customer - which in this case, is the manufacturer of the notebooks. The financier may finance the supplier in the variety of ways-usually the required amount that the supplier has requested for ($1,000, 000), plus an interest rate. The interest rate in this case may vary, depending on the risk assessment by the financier of the manufacturer. The problem may arise when the supplier has very tight profit margins of the computer hard-drives (inventory). This may make the cost of financing relatively expensive to the supplier.

[50] The supplier cannot combine the two forms of financing because the supplier cannot obtain inventory financing if the inventory is sold to the manufacturer.

[51] A low cost of financing can be obtained in the case where the sold inventory is collateral, and either a purchase guarantee is obtained from the manufacturer (inventory purchaser) or the sale receipts are pledged to the financial intermediary. The former is akin to the supplier selling the hard-drives to the manufacturer, pledging the sale receipts to the intermediary, and asking the manufacturer to pledge the sold inventory to the intermediary. The inventory supplier cannot implement such financing technique, -but the supply chain intermediary can easily do so.

[52] In the case of the supply chain intermediary, the inventory is physically residing within the intermediary's storage facilities for a time period, before being

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actually delivered to the manufacturing facilities of the manufacturer. The intermediary is in a good position to take ownership of the inventory. The intermediary also may be in a good position to secure a guarantee from the manufacturer to purchase the inventory within a pre-agreed time period. The intermediary alternatively may be in a good position to obtain an assignment of accounts receivable from the inventory supplier. In either case, the intermediary can have possession, ownership and/or control of the inventory, and at least one of a guarantee to purchase inventory from the manufacturer or an assignment of accounts receivable from the inventory supplier. The intermediary has the unique ability to bundle these assets together and generate a credible basis for financing.

[53] In such a case, the intermediary can obtain a lower cost of financing from the financier than can the supplier. The

intermediary can give the inventory supplier a much shorter payment cycle than the manufacturer, while at the same time charge a much lower interest rate than the supplier can where the supplier approaches the financial intermediary individually.

[54] In implementing zero inventory method financing, according to one exemplary embodiment, the intermediary will (1) obtain possession, ownership and/or control of the inventory, and (2) the intermediary will establish contracts with both the manufacturer and the inventory supplier for implementing zero inventory model (ZIM) financing, as illustrated in the flowchart of Fig. 1A.

[55] The intermediary will secure a contract with the inventory supplier as represented by step S 1 with the following exemplary terms, although many others may be used: [56] That the supplier will supply inventory to the supply chain intermediary within 3 days of receiving an intermediary purchase order form, from the intermediary.

[57] That the supplier shall supply the intermediary inventory according to data contained in all intermediary purchase order forms transmitted from the intermediary to the supplier within a 60-day period, at the fixed unit price.

[58] That the supplier will issue an invoice electronically to the intermediary with the following details:

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< Supplier Transaction Number > < Invoice Number > < Transaction Date and
Time > & < Purchase Order Code > % % % < Destination Manufacturer ID
Number > % % % # < Item Code ? Item Quantity? > #% % % < Transaction
Termination Number >
That the supplier will be paid according to the following payment terms:
Payment to specified bank account within 7 days from date of receipt of inventory at the intermediary's storage facilities.

Payment to be discounted from original invoice value at the rate of X%.

[59] The intermediary also will enter into a contract with the manufacturer, as represented in step S2, with the following exemplary terms, although many others may be used:
That the manufacturer unconditionally purchase the entire value of the inventory (at a fixed unit price) from the intermediary, within a time period of
60 days.

That the manufacturer can implement the purchase in multiple purchase orders within the time period of 60 days.

That the purchase orders be electronically transmitted to the intermediary in the following (exemplary) format : <
Manufacturer Transaction Number > < Invoice Number > < Transaction Date and Time > & < Purchase Order Code > % %
% < Manufacturer ID
Number > % % % # < Item Code? Item Quantity? > #% % % < Transaction
Termination Number > [60] Referring to Figures 2A and 2B, an arrangement of a supply chain 200 is schematically illustrated, wherein one or more suppliers 210 (only one is shown but plural suppliers may be involved), who manufacture or assemble components, provide their inventory to a supply chain intermediary 220 for delivery to a manufacturer 230 (only one is shown but plural manufacturers may be served by the supply chain). As would be understood by one skilled in the art, the supply chain structure may be much more complex than the simple linear form illustrated in the Figures, and one or more manufacturers 230 may require supplies from one or more vendors via one or more

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supply chains, where the output of the various suppliers will go into inventory and will be held by the intermediary of a respective supply chain.

[61] In the exemplary embodiment according to the flow chart of Fig. 1A and the arrangement as illustrated in Fig. 2A, the supplier 210, who wishes to provide goods to the one or more manufacturers 230, will enter into a contractual arrangement with the supply chain intermediary 220 that requires the supplier 210 to provide goods, and requires the intermediary to accept and store goods, pay the supplier for the goods and provide the goods to a manufacturer (optionally with value added), as in step S 1. In the transactions underlying this arrangement, the intermediary 220 will transmit to the supplier 210 an intermediary purchase order form in transaction 251.

The supplier in turn will provide goods to the intermediary in transaction 252.

Payment from the intermediary to the supplier 250 will be implemented in transaction
253, shortly after the invoice is received by the intermediary from the supplier 240, and that the intermediary 200 has received physical procession of the inventory at the intermediary's storage facilities. Immediately upon receiving physical possession of the inventory, and even indicia of ownership or control, the intermediary is in a position to obtain financing to pay on the supplier's invoices. Such financing can be obtained on highly favorable terms using the relationships outlined in Figs. 2B and
2C.

[62] Referring to Fig. 2B, and with reference also to step S2 in Fig. 1A, the supply chain intermediary 220 also will enter into a contract with the manufacturer
230. The contract will require the intermediary to provide goods from storage on a just in time basis, in quantities stated in

purchase orders issued in transactions 261.

Payment for the goods will be made on standard commercial terms in transactions
262. However, the intermediary also will require a purchase guarantee 263 from manufacturer 230.

[63] Alternatively, with reference to Figs. 1B and 2C, the supply chain intermediary 220 also may obtain from the supplier 210 an assignment of accounts receivable from the supplier in transaction 254, as illustrated in step S 11. The assignment may relate to the accounts receivable for all or a part of the particular goods that have been delivered to the intermediary, and/or may relate to other accounts receivable due to sales to a third party. In this case, the relationship to the

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manufacturer 230 is not directly relevant, yet the intermediary can still satisfy the manufacturer's requirements for just in time delivery.

[64] In yet another variation, an alternative asset of the supplier may be used instead of accounts receivable, and may include an inventory consumption forecast, provisional purchase order, purchase order, or provisional contract for purchase, from either the supplier and/or the intermediary's own clients/buyers of inventory.

[65] Whether operating in accordance with the arrangement of Figs. 1A and
2A, or 1B and 2B, or even a combination of them, the intermediary has both the physical possession and/or ownership of the inventory as well as a second asset, comprising the manufacturer's guarantee or the assignment of accounts receivable from the supplier. This combination of assets enables the intermediary to issue a security (Step S3 in Fig. 1A and Step S12 in Fig. 1B) that can be used as a basis for obtaining financing on highly favorable terms (Step S4 in Fig. 1A and Step S13 in Fig. 1B).

[66] When calculating the amount of financing to be provided to the supplier based on the relevant asset values, some or all of the following steps may be taken: (1) computing the net value of the inventory assigned from the supplier to the intermediary; (2) computing the net value of the accounts receivables assigned from the supplier to the intermediary ; (3) deriving a combined value of the two assets assigned from the supplier to the intermediary; and (4) attaching a financing cost chargeable to the supplier based on the combined value.

[67] The intermediary may also include in the financing cost the supplementary costs and expenses relating to its provision of services to the supplier, including, but not limited to: (1) the net cost of information technology; (2) the net cost of warehousing, logistics and transportation; and (3) the net cost of risk, insurance, inventory insurance, and accounts receivables administration. Some or all of such net costs would be added to said financing cost to derive a total cost of service. The cost of service may be expressed as a percentage of the total value of the inventory, and the intermediary may conveniently offer its services as a percentage of the total value of the inventory.

<Desc/Clms Page number 17>

[68] Consequently, the intermediary can make use of assigned assets from the said customer to consolidate into a single financial instrument that is fully negotiable, having a value comprising of the following: net value of inventory assigned to the instrument, net value of accounts receivables assigned to the instrument, net amount payable to the intermediary due to services provided to the supplier, and an assignment agreement of the intermediary to assign a net amount payable by the supplier to the instrument.

[69] When the zero inventory model (ZIN4Tm) is applied to a one-to-many model, the benefits are amplified even further, particularly where there are plural manufacturers from different industries, for example, and/or where the supply chain intermediary is dealing with a multitude of suppliers. For example, assuming a case where there are 5 manufacturers and 1000 suppliers, with a uniform division of just
200 suppliers per manufacturer, the benefits may be significant. Further assume that only 10% of the suppliers are interested in zero inventory model financing, but they sell a collective value of inventory worth $100 million, with an average turn-around of 15 days. The suppliers may have a group median of about 7% for the cost of AR financing. The financier may offer funds ($100 million) for 3.25% if :
The collective purchase guarantees presented by the supply chain intermediary has a diversified risk portfolio from 5 different industries;
Purchase guarantees come with collateral of inventory from 5 different industries; and
Collaterized inventory is sold on a just-in-time basis every 15 days.

[70] This can only be possible if the financier implements asset securitization of the collective cache of guarantees and collateral presented. Asset securitization may be obtained in any of a number of ways, including discounting the face value of the secured asset against the seller of the securitization paper, issuing rights to different buyers of the securitization paper at separate rates of discount, etc.

The financier must use securitization and cannot provide a bank loan to the supply chain intermediary for 3.25%, since the cost of capital is probably pegged to the

<Desc/Clms Page number 18>

bank's deposit rates. The supply chain intermediary charges a flat rate of 4. 1 % to the suppliers-who can can't get rates that are competitive to the one offered by the intermediary. The supply chain intermediary makes a spread of 0.85% on $100 million worth of zero inventory model financed instruments.

Assuming the group median credit term of the 5 manufacturers is 60 days, a simple calculation will mean that the ZIM process may be repeated 6 cycles in one year. $5,100, 000 of recurring revenue earned each year. This return is obtained from 10% of 1.000 suppliers spanning 5 manufacturers, with a collective inventory value of $100 million.

Clearly, in the case of zero inventory financing, there is a primary party driving the financing flow, typically, the supply chain intermediary. The driving party is (la) securing a guarantee from another entity, or (lb) securing assignment of accounts receivable from another entity, and (2) tying such a guarantee or assignment to another security (such as inventory as collateral) from a financier.

The driving party is then making use of this consolidated instrument to procure funding, particularly providing money at a lower cost to the supplier or intermediary.

Notably, using this arrangement, the driving party can provide the funds to a consolidated group of entities, or secure the consolidated instruments from such a group to perform financing.

The securitization of a zero inventory model (ZIMTM) instrument with a purchase guarantee and pledging of inventory may have the following structure:
Purchase guarantee from manufacturer ABC; and
Inventory pledged to security.

The above structure does not allow for the pledged inventory to go beyond the control of the inventory owner-which in this case will no longer be the supply chain intermediary. The ownership now resides with the purchaser of the security (e. g. , the financier), since the supply chain intermediary will need to sell the security to the financier to obtain cash for payment of inventory to the supplier.

However, as the manufacturer makes incremental purchases, the value of the pledged inventory will have a mechanism to incrementally reduce the pledged value, and the corresponding liabilities of parties involved. The purchase guarantee must also reflect the change in liabilities of the manufacturer.

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[75] Notably, this arrangement is in compliance with current Financial
Accounting Standards Board rules, particularly FAS Rule 125 regarding the transfers and servicing of financial assets and extinguishment of liabilities, since the treatment of liabilities and asset obligations is recognized and derecognized at appropriate times when the control of assets changes significantly, as specified in sections (a) - (c) in paragraph 4 of FASB Rule 125. The operating and accounting impact on the manufacturer in one instance is significant, since the manufacturer has the advantage of making incremental purchases on a just-in-time basis by using its rights under the ZIMTM initiated purchase guarantee with the intermediary. The manufacturer benefits from flexibility in operating cash flows, since inventory can now be purchased on a just-in-time basis-however, the financial impact is just the same, since improved cash flow is countered by the issuance of a purchase guarantee to a third party (the supply chain intermediary). Compliance with the FAS 125 rule, however, will mean the presence of operating liabilities (or accounts payable).

[76] The technology involved with the zero inventory model must consider the needs of the several parties, particularly the financier who is asked to take the risk and advance funds on the basis of the securitization issued by the intermediary.

Generally, the financier would require the several technology-based assurances before committing to some kind of arrangement to procure and raise funds under the ZIMTM arrangement. First, the financier would have to be satisfied that an electronic message coming from a particular computer system, especially one not under its control, or regulated by rules of a governing authority, is really what it claims to be. The financier will typically engage an independent third party auditing company to implement such system. Today, the system would need to have at least the normal security features of current computer systems, so that the transaction channel would fully mesh with the financier's own internal systems. Some of the following are implementations. which are currently adopted by financiers: IBM AS400 transaction system (implemented after 1985);
UNIX transaction system (common for IBM OS/390 mainframes);
RC4 security implementation of data and communications, PKI, biometrics, digital certificates etc.;
Multi-tier access control administration;

<Desc/Clms Page number 20>

Network traffic analysis, port control and access administration; and
Secured and dedicated data and communications, including leased lines, VPN etc.

[77] There are of course many other forms and embodiments where separate and distinct systems are used (such as NT. Linux. UNIX-SCO etc.), although there are seldom wide variations in the above configuration.

4 [78] The technical integration of newer systems such as the AS400 to older mainframes (still forming the bulk of back-end infrastructure) are dependent on the basis for electronic communications between the interfaces that operate transaction processing etc.

[79] The zero inventory model (ZIMTM) for trade financing offers a revolutionary shift in financing for suppliers in almost every industrial segment today, since the supply chain intermediary or service provider covers virtually every industry sector.

In an operating environment, a small spread of just 25 basis points of the value of the securitized asset can yield millions of dollars in recurring revenue from a relatively small cache of inventory. ZIMTM has the capability of changing the entire financing service level currently in place with tens of thousands of suppliers that power the manufacturing output of the world's largest companies, brands and services. To this end, in implementing zero inventory model financing, certain important components that should be addressed are:
FAS 125 compliance and operating implementation;
Financial performance of supply chain intermediary due to FAS 125;
Technology and data processing/interface;
Technology auditing and accountability reporting;
Efficient transaction systems to minimize processing costs related to FAS 125; and
Benefits versus Considerations analysis for manufacturer.

[80] Consideration of these components, as would be understood by one skilled in the art, would lead to a supply chain system that is adapted to providing

<Desc/Clms Page number 21>

low-cost financing for suppliers using a zero inventory model, while being compliant with applicable FAS guidelines.

[81] The supply chain system that would implement the zero inventory model would require a reliable and secure event notification system. The system would be adapted to receive electronic data from a multitude of physical manufacturing and storage management computer units and sensors, and would be adapted to securely transmit messages to any device that is connected or registered on the system via public and private systems, including switched networks, wired and wireless systems and the Internet. Referring to Fig. 3A, the core of the supply chain processing and event notification system comprises a computer server 10, which provides a centralized monitoring, data processing, command and control function for the entire system. In an alternative embodiment, the server 10 may have some or all of its functions distributed, rather than centralized, as is well known in the art. The server 10 is coupled to an analogue-to-digital or digital-to-analogue converter and interface unit 30. The interface unit 30 receives electronic signals and converts them into binary data for information processing by the server 10. Data resulting from the activity of server 10 is stored in a computer database within a memory 20, and may include updated data or new data. The server 10 also retrieves data, in the form of software programming and parameters that are applicable to the signals received from the interface unit 30, from data storage 20. For example, the server 10 may maintain in the database a list of wireless devices 60 that the communications interface unit 50 can electronically alert, and may update that list periodically. The listing may be by unique serial number, address and/or ID, specifically assigned to a respective device
60. The devices 60 may be mobile devices to which the interface unit 50 sends data via a wireless communications unit 40 for electronic alerting of the devices 60.

[82] The storage 20 also stores selections that a registered user of the system pre-programs. For example, the registered user can program the following:
A-Supply chain event or process:
B-Urgency Level 1
C-Urgency Level 2
D-Urgency Level 3:
E-Device name for level 1

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F-Device name for level 2
G-Device name for level 3 [83] The storage 20 also can include signal indicator numbers that interface units 30,40 and 50 may transmit and which correspond to the programmed event or process. The storage 20 also store database tables having reference data fields that match each the urgency level (B), (C) and (D) to each of the device names (E), (F) and (G).

[84] A further desirable system feature, but not necessarily a requirement, for the zero inventory model is an electronic proof-of-delivery (ePOD) process. With reference to the sub-system illustrated in Fig. 3B, the process can receive electronic instructions from a mobile device 150, to wireless communications interface unit 140 and communications interface unit 130 to cause the server 100 to initiate an electronic request to another mobile device 170 for user authentication. The authentication is via a user-name and password combination, or a PIN Personal Identification Number or via a combination of an electronic signature. If the authentication is successful, mobile device 170 allows the user to input information, instructions and commands related to acceptance, approval, rejection, and/or confirmation of inventory.

[85] For example, a device 170 may have a capability and display for displaying an electronic menu of options during a delivery of goods from inventory to a intended recipient by delivery personnel. The menu could have one or more of the following menu items and associated implementing software and hardware at unit: a means to select a delivery order number and/or identification, a means to allow selected delivery order number to be further coupled with a transaction status, wherein the transaction status includes delivery order completed, delivery order not completed, delivery order delayed, delivery order pending due to exception, delivery order not possible due to recipient not available at location of delivery.

[86] The menu selection can result in a transmission of a message to the controller that establishes an electronic proof of delivery (ePod).

[87] The software and hardware at the supply chain management system controller 10, including the interface components 40 and 50, may comprise a means to

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accept a range of electronic messages from any number of registered users. On the basis of such messages, the controller 10 may generate electronic commands to direct the flow of inventory from multiple locations to a single central location for one or more of warehousing, assembly and packaging. The messages may also cause the controller to generate electronic commands to direct the flow of inventory either being warehoused, assembled or packaged, from a single central location to multiple, designated locations for delivery. In general, such commands will allow for instructions to direct the movement of inventory from one location to another based on the systemic issuance and acceptance of messages from any given number of users having being registered onto the said system. The instructions may include having all information related to inventory being stored onto the system accompanied by data such as assembly/packaging requirements, and having the system to match and generate instructions based on stored parameters about locations that can facilitate the warehousing, assembly and/or packaging of pre-determined inventory type.

[88] The supply chain management system controller 10 also may have software and hardware that comprise a transaction means to allow for other related supply chain processes to be triggered, notified, implemented, and/or alerted to any number of registered users pending the broadcast of individual delivery transaction status and/or confirmation.

[89] The supply chain management system controller 10 will also have software and hardware that enables a user to effect payment 160 of inventory via the user's financial institution 120 to an interface 110 operated by the supply chain intermediary. The payment 160 is effected after mobile device 170 has completed any user input that is required prior to the initiation of payment 160.

[90] The implementation of the functions described herein are readily implemented by those skilled in the art without undue experimentation. Moreover, there are many other modifications that can be made within the spirit and scope of the invention, as would be readily understood by persons skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example herein.

Last updated: 26.04.2011 Worldwide Database 5.7.22; 93p

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Claims: JP 2005510789 (T)

METHOD AND APPARATUS FOR MANAGEMENT, FINANCING AND SUPPLY IN AN INTEGRATED SUPPLY CHAIN SYSTEM

Claims not available for JP 2005510789 (T)
Claims of corresponding document: WO 03046681 (A2)

Translate this text Claims tree

I CLAIM

1. A method of financing the provision by at least one supplier of goods to at least one manufacturer via a supply chain intermediary, comprising: placing a quantity of goods in inventory by said at least one supplier; taking ownership and control by said supply chain intermediary of said quantity of goods in inventory from at least one supplier; and securing by said supply chain intermediary a purchase guarantee from at least one manufacturer requiring purchase of said quantity of goods in inventory; and securing financing by said supply chain intermediary from a financing entity, on the basis of the ownership of said quantity of goods in inventory and said purchase guarantee.

2. The method of claim 1 further comprising, incrementally purchasing goods by said at least one manufacturer under said purchase guarantee; delivering incrementally purchased goods by said supply chain intermediary to said at least one manufacturer, on a just in time basis, and making payment by said manufacturer to said supply chain intermediary as said goods in inventory are delivered on a just in time basis.

3. The method of claim 1 further comprising, paying said at least one supplier for said quantity of goods in inventory by said supply chain intermediary from said financing.

4. The method of claim 1, wherein said agreement of at least one manufacturer is to purchase said quantity of goods in inventory within an agreed time period.

5. The method of claim 4, wherein said agreement of at least one manufacturer is to buy out the entire value of any portion of said inventory remaining unpurchased at the end of said time period.

6. The method of claim 1, wherein said at least one manufacturer comprises a plurality of manufacturers, at least two being in different industries.

7. The method of claim 2, wherein said purchase guarantee includes a pledged value of inventory, further comprising,

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reducing the pledged value of inventory as the manufacturer takes possession of inventory incrementally based on just in time delivery.

8. A method of claim 1, wherein said step of securing financing further comprises: implementing asset securitization of said inventory by said supply chain intermediary, on the basis of said purchase guarantee and said ownership of said quantity of goods.

9. A method of claim 1, wherein said step of securing financing further comprises: creating a negotiable bankable instrument on the basis of said purchase guarantee and said ownership of said quantity of goods.

10. The method of claim 1 further comprising, providing a payment by said at least one supplier for said quantity of goods in inventory by said supply chain intermediary from said financing, said payment being discounted for supply chain services and costs of said financing.

11. A method of financing the provision by at least one supplier of goods to at least one manufacturer via a supply chain intermediary, comprising: placing a quantity of goods in inventory by said at least one supplier; taking ownership and control by said supply chain intermediary of said quantity of goods in inventory from said at least one supplier in exchange for an agreement by said supply chain intermediary to pay for said quantity of goods, creating at least one supplier account receivable; obtaining by said supply chain intermediary assignment of said at least one supplier account receivable; and securing financing by said supply chain intermediary from a financing entity, on the basis of the ownership of said quantity of goods in inventory and said assignment of said at least one supplier account receivable.

12. The method of claim 11, further comprising: obtaining by said supply chain intermediary assignment of additional assets from said at least one supplier; and said securing financing step is further based on said assignment of additional assets.

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13. The method of claim 11 further comprising, providing a payment to said at least one supplier for said quantity of goods in inventory by said supply chain intermediary from said financing, said payment being discounted for supply chain services and costs of said financing.

14. A method of claim 11, wherein said step of securing financing further comprises: implementing asset securitization of said inventory by said supply chain intermediary, on the basis of at least said assigned accounts receivable and said ownership of said quantity of goods.

15. A method of claim 11, wherein said step of securing financing further comprises: creating a negotiable bankable instrument on the basis of said purchase guarantee and said ownership of said quantity of goods.

16. The method of claim 11 further comprising, incrementally purchasing goods by said at least one manufacturer from said supply chain intermediary; delivering incrementally purchased goods by said supply chain intermediary to said at least one manufacturer, on a just in time basis, and making payment by said manufacturer to said supply chain intermediary as said goods in inventory are delivered on a just in time basis.

17. A method of financing the provision by a supplier of goods to at least one manufacturer, comprising: the supplier placing a quantity of goods in inventory; a financing entity taking ownership and/or control of said quantity of goods in inventory from said supplier; a financing entity obtaining assignment of at least a part of said supplier's account receivables; and creating a negotiable instrument by said financing entity on the basis of its ownership and/or control of said quantity of goods in inventory and said assignment of said at least a part of said supplier's account receivable.

18. The method of claim 17, further comprising: obtaining by said financing entity an assignment of additional assets

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from said at least one supplier; and said securing financing step is further based on said assignment of additional assets.

19. The method of claim 17 further comprising, providing a payment to said supplier for said quantity of goods in inventory from said financing, wherein said payment is discounted for costs of said financing.

20. The method of claim 19, wherein said payment is further discounted for supply chain services.

21. A method of securitization, involving: a supply chain intermediary taking ownership of inventory from at least one inventory supplier and securing at least one of a purchase guarantee from an inventory purchaser and an assignment of accounts receivable from said inventory supplier; and issuing a financial instrument on the basis of a combination of said ownership and at least one of said purchase guarantee and said assignment of accounts receivable.

22. The method as claimed in claim 21, including: said supply chain intermediary obtaining financing on the basis of said financial instrument; and said supply chain intermediary making payment to said inventory supplier for said inventory from said financing.

23. The method as claimed in claim 22, including: permitting said manufacturer to purchase said inventory from said supply chain intermediary on a just-in-time basis; obtaining payment from said inventory purchase with each said purchase; and paying down said financing on the basis of said payment.

24. The method as claimed in claim 22, wherein the step of making payment is in an amount based on at least: (1) computing the net value of the inventory assigned from the supplier to the intermediary; (2) computing the net value of the accounts receivables assigned from the supplier to the intermediary; (3) deriving a combined value of the two assets assigned from the supplier to the

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intermediary; and (4) attaching a financing cost chargeable to the supplier based on the combined value.

25. The method as claimed in claim 24, wherein the financing costs comprise at least one of : (1) the net cost of information technology; (2) the net cost of warehousing, logistics and transportation; and (3) the net cost of risk, insurance, inventory insurance, and accounts receivables administration.

26. The method as claimed in claim 21, wherein said single financial instrument is fully negotiable, having a value comprising: net value of inventory assigned to the instrument, net value of accounts receivables assigned to the instrument, net amount payable to the intermediary due to services provided to the supplier.

27. A supply chain system adapted to support a zero inventory model of financing, comprising: a supply chain management system controller, data access and storage means coupled to said controller, communications means coupled to said controller and being operative to send addressable and broadcast messages, and to receive messages, and a plurality of remote communication units coupled to said controller via said communications means for receipt of at least one of addressable and broadcast messages and for transmission of messages to said controller, said communication units including at least financial institution units and inventory units, said inventory units being at least one of disposed or disposable at an intermediary warehouse site, transportation site or customer site.

28. A system as claimed in claim 27, wherein said system is provided with conditions and/or details of each supply chain process, said conditions providing an ability to establish and identify the degree of urgency of a condition, and wherein said

supply chain management system controller is adapted to send a message to a specific remote communications unit or plural remote communication units related to said condition and said degree of urgency.

29. A system as claimed in claim 27, wherein said system is adapted to permit registration of said remote communications units at said controller using unique identification data; and

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said remote communications units are adapted to send messages related to an electronic proof of delivery to any number of additional registered remote communication units.

30. A system as claimed in claim 27, for implementing an electronic proof of delivery process with regard to an order for delivery of inventory. wherein: said controller is adapted to transmit a request for confirmation of a transaction status regarding delivery of inventory; said remote communications units are adapted to receive such request and to transmit a reply regarding acceptance and receipt of inventory; and said controller is adapted to notify plural remote communications units of the transaction status of said delivery following receiving said reply.

31. A system as claimed in claim 30, wherein said controller is operative to have remote communications units concerned with other related supply chain processes, notified pending the broadcast of individual delivery transaction status and/or confirmation.

32. A system as claimed in claim 30, wherein each said remote communications unit comprises a processor and a display that is operative to display selectable items, said items comprising: means to select a delivery order identifier, and means to allow said selected delivery order identifier to be further coupled with transaction status information. wherein the transaction status information includes at least one of delivery order completed. delivery order not completed, delivery order delayed, delivery order pending due to exception, delivery order not possible due to recipient not available at location of delivery. and wherein said selected order identifier and transaction status information is transmitted to the controller and may serve as an electronic proof of delivery.

33. A system as claimed in claim 27, wherein, said controller further comprises: means to accept a range of electronic broadcast messages from plural registered remote communications units; and means for generating in response to selected ones of said messages.

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electronic commands to direct the flow of inventory from multiple locations to a single central location for at least one of warehousing, assembly or packaging.

34. A system as claimed in claim 27. wherein, said controller further comprises: means to accept a range of electronic broadcast messages from plural registered remote communications units; and means for generating in response to selected ones of said messages, electronic commands to direct the flow of inventory, comprising at least one of warehoused, assembled or packaged goods, from a single central location to multiple, designated locations for delivery.

35. A system as claimed in claim 27, wherein, said controller further comprises: means for directing the movement of inventory from one location to another based on the systemic issuance and acceptance of broadcast messages from any of plural remote communication units.

36. A system as claimed in claim 27, wherein, said controller further comprises: means to generate instructions to direct the movement of inventory from one location to another for purposes of at least one of warehousing, assembly and packaging said inventory. and means to match and generate said instructions based on stored parameters about locations that can facilitate the at least one of warehousing, assembly and packaging of pre-determined inventory types.

37. A method of implementing an electronic proof of delivery process with regard to an order for delivery of inventory in a supply chain involving at least an intermediary and one of an inventory supplier and an inventory purchaser, comprising at least one of : (1) directing the movement of inventory from an inventory supplier location to an intermediary location. whereby said inventory is moved for at least one of warehousing, assembly and packaging requirements; (2) directing the movement of inventory from an intermediary location where said inventory is at least one of warehoused, assembled or packaged. to at least one designated intermediary purchaser location; and

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(3) transmitting information regarding movement of inventory from a delivery location to at least one other location.

38. The method of claim 37. wherein said transmitting step further comprises: electronically transmitting a request for confirmation of a transaction status regarding delivery of inventory; electronically transmitting a reply regarding acceptance and receipt of inventory; and electronically transmitting to plural locations the transaction status of said delivery following receiving said reply.

39. The method of claim 38, wherein at least one of said steps of directing are based on the systemic transmitting and acceptance of broadcast messages from any of plural remote communication units in order to facilitate the at least one of warehousing. assembly and packaging of inventory.

40. The method of claim 37, further comprising directing payment for inventory in response to said step of transmitting.

Last updated: 26.04.2011 Worldwide Database 5.7.22; 93p

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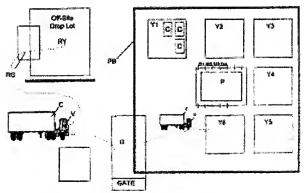
Bibliographic data: JP 2002501000 (T)

CONTAINER AND INVENTORY MONITORING METHODS AND SYSTEMS

Publication date:	2002-01-15	
Inventor(s):		
Applicant(s):		
Classification:	- **International:**	***B65G1/137; B65G63/00; G06Q10/00; G06Q50/00; G08G1/127;*** (IPC1-7): B65G1/137; B65G63/00; G06F17/60
	- **European:**	G06Q10/00D; G06Q10/00E; G08G1/127
Application number:	JP20000528966T 19990125	
Priority number (s):	US19980013392 19980126; WO1999US01455 19990125	
Also published as:	• JP 4450506 (B2) • WO 9938136 (A2) • WO 9938136 (A3) • US 6148291 (A) • JP 2010047423 (A) • more	

Abstract not available for JP 2002501000 (T)
Abstract of corresponding document: WO 9938136 (A2)



Container and inventory monitoring methods and systems provide detailed logistical control of containers, shipping racks and resident and in-transit inventory. The methods and systems create and maintain accurate real-time records of the location, movement and load status of containers, racks and inventory within the facility boundaries and between facilities such as factories, assembly plants, warehouses, shipping yards and freight switching facilities. Detailed data on container switching, unloading and loading activity is recorded and archived. A virtual inventory accounting is provided by tracking from customer release orders to supplier shipments and rack returns.

Last updated: 26.04 2011 Worldwide Database 5.7.22; 93p

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European Patent Office
Office européen des brevets

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Description: JP 2002501000 (T)

CONTAINER AND INVENTORY MONITORING METHODS AND SYSTEMS

Description not available for JP 2002501000 (T) Description of corresponding document: WO 9938136 (A2)

Translate this text

Title of the Invention
CONTAINER AND INVENTORY MONITORING METHODS AND SYSTEMS
Related Applications
This patent application is related to U.S. patent application serial no.

08/519,888, filed August 28, 1995, issued as U.S. Patent No. 5,712,789.

Field of the Invention
The present invention pertains generally to logistics methods and systems for tracking and control of containers, shipping racks and inventory. More particularly, the invention pertains to methods and systems which create and maintain an accurate record of the location and movement of containers, racks and inventory within the boundaries and between sites such as factories, assembly plants, warehouses, shipping yards and freight switching facilities.

Background of the Invention
In the related application, a method and system is described for monitoring the location and load status of containers within the boundaries of a manufacturing or shipping or warehouse facility. The invention eliminates the substantial cost of locating containers within sprawling shipping container receiving yards, so that the container can be readily brought to an assigned dock for unloading. The present application focuses even more closely on the movement and load status of containers in transit and within yards and production facilities such as automobile factories, and describes unobvious enhancements and additions to the container monitoring methods and systems which yield even more accurate and detailed information on the location and status of containers, shipping racks, and running inventories. The described enhancements reduce waste and inefficiency in the common shipping process from a supplier (such as a manufacturer of parts), a carrier (such as a trucking or shipping or freight forwarding company), a warehouse, and an end customer who assembles parts together to make a complete product.

Tracking of containers in transit is well developed, including the use of satellites and other electronic technology to obtain real-time data on in transit locations. Inventory accounting and management is also a well developed filed in which the contents of very large warehouses are ascertainable to high level of detail at any point in time. Areas which lack total control over the status and accounting of goods and the conveyances needed to move the goods are in yards in which containers are received at a facility, and in the facilities. Without information on the location and load status of containers at a facility, or an accounting for a number of parts (especially small parts) within a facility, a manufacturer or supplier or carrier has no way of calculating a current, real-time accounting of assets.

For example, in a typical sale and shipment of goods transaction, a carrier may know from a satellite tracking system that a container has reached a factory, but does not know if the container has been emptied, partially emptied, reloaded, or the contents of a reload such as racks. The carrier's "asset" in the shipping transaction is a bill of lading which he presents to the factory upon completion of the delivery. But the bill of lading cannot be paid upon until the delivery is complete. Thus the carrier must have information on the load status of the container at the factory. A supplier's asset is the account receivable for the goods delivered to the factory. Payment of the supplier's invoice may be conditioned upon not only delivery of the goods, but actual assembly of the goods into a finished product, known as "paid-on-production". The supplier's assets may also include be considered to include any racks which must be returned to the supplier so that a subsequent shipment of goods can be made. In some cases the supplier may in fact own the racks and is therefore further interested in having them returned. If the supplier does not learn of an incorrect return shipment of racks until a carrier arrives at the supplier's facility, the supplier (and possibly the customer) have incurred a loss. The customer's asset is of course the ordered goods such as parts. To reduce or eliminate the cost of holding parts prior to assembly, the customer wants to receive the goods ideally not until the time at which they are needed for assembly. To coordinate this, the customer must have information on the transport of the goods to the factory by the carrier. While just-in-time delivery of parts is a good concept which can be applied to some manufacturing operations, it is not practical for all production. Therefore, the customer inevitably ends up holding some parts on the premises and is in effect functioning as a warehouse. In order to minimize the cost of this holding or warehousing, the customer must know which goods have arrived in which containers, and where the containers are located.

Another critical area which is not addressed at all by most logistics systems is that of racks which support product within a container. In many respects, these racks, their location, expected time of arrival on return, and condition, are just as critical and valuable as the products they carry. For without racks, many products cannot be shipped. There is thus a need to track shipping racks, particularly on the return trip to suppliers, as closely as the shipment of product.

The prior art has also overlooked the logistical management of relatively small parts such as fasteners or electronic

components. Small parts are typically delivered in containers of progressively smaller size, from pallet to carton to box. Holding a quantity of small parts greater than is immediately required leads to losses within an assembly facility. Thus a system is needed to track the deliver of small parts containers and to monitor the running inventory in comparison to completed production.

Summary of the Invention

The present invention provides methods and systems for improved logistical controls over shipping container tracking, switch monitoring and load status, and realtime total inventory accounting. In accordance with a fundamental aspect of the invention, a container monitoring system is provided for accumulating and storing information on shipping containers, including location and load status. The system includes a receiving area for receiving containers to be monitored by the system, the receiving area within a defined boundary within which container are to be monitored by the system, a container entry point at the boundary at which containers are identified by pre-existing identification codes which are recorded at the container entry point, a switching vehicle for moving containers to and from a receiving area and to and from a facility within the boundary according to instructions received from the facility, and means for recording information on location and load status of containers within the defined boundary, including information on receiving area identification, and identification of containers in designated slots within a receiving area.

The invention further provides computer means for generating reports on container arrivals at a facility, numbers of moves of a container by a switching vehicle within a receiving area, and locations and unloading activities of containers at docks at a facility.

The invention also provides a system for monitoring and locating containers within a monitored network of container shipping terminals and destination facilities.

The system enables a carrier to identify the terminal or facility within a network at which a particular container is located, to know where within a terminal or facility a container is located, and to know the load status of a container within a terminal of facility.

The invention also provides a virtual inventory tracking system which generates real-time data on product shipments within containers in transit, at a facilty, and within a facility.

The invention also provides a method and system for creating electronic and paper records of shipping rack return activity from reloading of racks into a container to completed return of racks to a supplier.

And, the invention also provides a metered warehousing and delivery system for production driven delivery and control of small sized inventory.

These and other aspects of the invention are herein described in particularized detail with reference to the accompanying Figures, the Figures being representative of but some of the various ways in which the principles and concepts of the invention may be carried out.

Brief Description of the Figures

In the accompanying Figures:

FIG. 1 is a schematic diagram of the basic operational components of one embodiment of the container monitor and control system (CMCS) of the present invention;

FIG. 2 is a schematic diagram of the basic hardware components of the Container Monitor Control System (CMCS) of the present invention including related databases, management information systems and input and communications devices;

FIG. 3 is an example of a container status report generated by the container monitor and control system of the present invention;

FIG. 5 is flow diagram of certain processing steps of the container monitor and control system of the present invention;

FIGS. 6A-6C are representative screen displays generated by a computer program which performs certain functions of the container monitor and control system of the present invention;

FIGS 7A-7D are examples of screen displays and dock activity reports generated by a computer program which performs certain functions of the container monitor and control system of the present invention;

FIGS. 8A-8B are examples of screen displays and summary reports of container arrivals at a facility generated by a computer program which performs certain functions of the container monitor and control system of the present invention;

FIGS. 9A-9B are examples of screen displays and summary reports of container switching activity at a facility generated by a computer program which performs certain functions of the container monitor and control system of the present invention;

FIGS. 1 0A-10B are examples of screen displays and live unload exception reports on container unloading activity at a facility generated by a computer program which performs certain functions of the container monitor and control system of the present invention; FIGS. 1 1A-I 1F are examples of screen displays and reports on container locations, identities, and load status within parking slots within container receiving yards, generated by a computer program which performs certain functions of the container monitor and control system of the present invention;

FIGS. 12A-12D are examples of screen displays and reports pertaining to container locations at terminal within a monitored network of facilities or terminals, generated by a computer program which perfonns certain functions of the container monitor and control system of the present invention;

FIGS. 1 3A- 1 3D are flow diagrams of a virtual inventory tracking process of the present invention;

FIGS. 14A-14C are flow diagrams of a process for recording, verifying and producing electronic and paper records for return delivery of shipping racks in accordance with the present invention, and

FIG. 15 is schematic diagram of a metered warehousing and parts delivery process anci system in accordance with the present invention.

Detailed Description of Preferred and Alternate Embodiments
FIG. 1 schematically illustrates one application of a basic aspect of the container and inventory monitoring system of the invention, within the confines of a facility boundary B. A facility F may be a factory, warehouse sub-assembly plant, freight transfer station, distribution center, or any other place where shipping containers are loaded or unloaded. The facility boundary B is the area which surrounds or is associated with the facility F. As used herein, the term "system" refers to the described equipment, hardware and software used to carry out the described methods of container and inventory monitoring and to the apparatus and equipment used to operate the system, including computer hardware and software, peripheral data input devices, monitors, communications devices and transportation vehicles, shipping containers and shipping racks. In the basic system shown in FIG.

1, the system accumulates, stores and disseminates information on containers C with respect to the location of containers relative to facility boundary B locations within the facility boundaries but outside the facility referred to as the receiving areas or yards Y, and docks D which are designated entrances or doors to a facility F. Entry to and exit from the facility boundary B is directed through and controlled by gate G.

As further described herein, important time sensitive data on containers and container loads which the system uses is collected at entry points to a facility boundary B such as gate G.

As further shown in FIG. 1, each receiving area Y is assigned a unique designator such as Y1, Y2, etc. Each of the docks are uniquely designated such as D1. D2, etc. Movers of shipping containers, and each shipping container is also uniquely identified by a code or number. For example, in the trucking industry, each of the vehicles of carriers or shipping companies which move containers are uniquely identified by, for example, an alpha "SCAT" code which may correspond to the name of the shipping company. Each of the containers are assigned an individual code (usually numeric) which is combined with the SCAT code to identify every carrier/container combination. This combination of codes is used to track containers and monitor carrier performance. The system is readily adaptable to other modes of shipping such as inter-modal ship/rail/truck containers, air freight containers, tankers, waste haulers, or any other type of shipping container. With coded identification of all carriers and containers, control over facility boundaries, and means for recording status and location of containers within a facility boundary, the system has the basic framework for compiling detailed data on the shipping process which can be used by the facility, suppliers and carriers to optimize logistics.

The system monitors and records all container movements and locations within the facility boundaries B. For example when a container C is delivered by a carrier vehicle V to a facility through gate G. its arrival date and time is loaded into the system and it is located within a receiving area or yard Y by motive means S. The location of the container within the yard Y is also recorded. as is the number of times the container has been moved since its arrival at the facility boundary B. This data is transferred or made available to the computer system of the facility as further described below. The movement of a container within the facility boundary B or yard
Y is referred to herein as a "switch". It is also generally referred to in the shipping industry as a "spot" or "drop".

FIG. 2 schematically illustrates an integrated system in which the computer system of the container and inventory monitoring system is combined with a computer system of a facility F. A container monitor and control system (CMCS) 10 includes a central processing unit 11 for receiving and processing container-related data, a container monitoring system database 12. a virtual inventory database 13. one or more container data input terminals 14 which may be locally or remotely located from the CMCS 10. a CMCS monitor 15, communications links 16 to remote computing systems and/or data receiving modules such as EDI, facsimile or e-mail or
Internet connections, remote container data transceivers 18, and one or more printers 20 for producing hard copy reports of container data acquired and processed by the
CMCS 10. In one possible hardware arrangement of the system 10, one or more container data input terminals 14 and monitors 15 may be located at a gate or gates G for input of data acquired from incoming and outgoing containers into the CMCS 10.

Many different types of data input devices can be used in connection with the system to input data on carriers and containers. A human operator located at gate G can input the data as carrier/containers arrive. Other input methods and devices include hand held radios operated by drivers of the switching vehicles S to communicate data to an operator; RFID tag and reader technology, ultrasonic detectors, optical scanners or RF data communications devices such as manufactured by Texas Instruments and
Teklogix, or bar code readers such s the Telxon PTC 921 and PTC 912DS. The switching vehicles S are preferably equipped with remote terminal reception and display devices which allow data input, data reception and real-time display on container locations and switching or movement instructions.

The CMCS 10 is interoperable with other computing systems such as for example a management information system (MIS) of a facility to which containers are delivered (referred to herein as the "lst customer MIS 30" or "customer MIS"), and/or an end or intermediate customer (referred to herein as the "2d customer MIS 60"), and/or an MIS of a container carrier business (herein "carrier MIS 40"). As used herein, the term "customer" refers to a recipient of goods from a supplier, as delivered by a carrier. The customer may be a warehouse, freight forwarder. subassembler, final assembler or seller of the goods delivered.

As further shown in FIG. 2, in a preferred embodiment of the invention the
CMCS 10 is commonly linked with a plant or customer MIS 30 and container carrier
MIS 40 for cross exchange of container and inventory data. Of course, connections could also be made to additional MISs and/or databases to further expand the accessibility of container data compiled by the CMCS 10. An MIS typically includes a set of computerized data collection, analysis and reporting tools which support business decision processes, including a database accessible by a computer programmed with data analysis and reporting software to generate informational reports A typical container monitoring sequence is now described with reference to the physical arrangement of FIG. 1 and the monitoring hardware and software described above with reference to FIG. 2. As a container C (pulled by a carrier vehicle V)

approaches gate G of facility F, the carrier and container identifying indicia on the vehicle (for example a SCAT code) which is input to the CMCS along with a corresponding container number which appears on the exterior of the container, along with the time of arrival. The recorded time of arrival of a container starts a retention time clock to accurately measure the total amount of time a container is retained on the premises of the destination facility such as facility F. This information is critical to both carriers and customers. Container retention times recorded by the system clearly identify for carriers containers which are held for excessive amounts of time. Customers, i.e., the ultimate recipients of the container contents, who must pay carriers for excess retention time of containers can use the information provided by the system to independently verify charges from carriers for excess retention.

In a preferred method of the invention, the carrier/container combination of data for each arriving container has been transmitted between the carrier MIS 40, supplier
MIS 50, and the customer MIS 30, in the form of an advance shipping notice (ASN) prior to the arrival of the container, so that as the carrier and container are identified and input to the CMCS upon arrival at facility F, and this information transmitted from the
CMCS to the customer MIS and/or carrier MIS, the system performs the function of communicating confirmation that a particular container has actually arrived at a destination. Once such confirmation is provided, the system continues to monitor the container about and within the premises of facility F.

Bill of lading information may also be transmitted from the carrier MIS to the customer MIS concerning each container, so that confirmation of arrival of the container (by identifying the carrier and container number only) is sufficient to enable to customer
MIS to specifically identify, for example, parts which have arrived on the premises and thus available for assembly. Although it is not necessary for the container monitoring system to know the specific contents of any particular container (as represented by an accompanying bill of lading), it is information which can be readily input to the CMCS (either by the carrier MIS, customer MIS, or through CMCS input terminal 14) to enable confirmation of delivery of specific contents-identified containers. In other words, data of the contents of any container can be stored and associated with carrier/container identifications within the CMCS as an alternative or addition to the data contents of the customer or supplier MIS.

Shipping rates and cumulative charges associated with bills of lading may also be entered in the CMCS. This data may be correlated with an independent accounts payable program (for example resident in a customer MIS) whereby payments from a customer to a carrier can be authorized by the data from the CMCS. By this method, payments to carriers are made only for containers/goods which have actually been received or unloaded on the customer's premises. Similarly, carriers can use the delivery confirmation data provided by the system to generate bills to customers with actual confirmation that a particular delivery has been made.

As alternatives to monitoring location and status of specific contents of containers (which is contemplated by the invention), one method of the invention is to monitor the load status of any given container by using designations such as "full" or "truck load", "partial load" or "empty". Load designation conventions can be used such as labeling all incoming containers as "full" in the CMCS (regardless of whether a container is actually full) and all outgoing containers "empty", based upon indications from the customer who is responsible for unloading the container. "Partial loads" are also identified based upon information from the customer that a particular container, only partially unloaded, is to be removed from a dock and returned at a later time.

Without the designation of such a container as a "partial load", the customer would have no efficient way of re-locating the container when the remainder of the parts are needed, or of monitoring that the container still had parts in it and should not be allowed to leave the premises until empty. All such load status data is input to the CMCS in the manners described for transmission, by facsimile, electronic mail or through an Internet or world wide web to the customer MIS and carrier MIS. Carriers are thus immediately notified when containers are empty and available for pick-up.

Also monitored by the system is cumulative load data for all incoming and outgoing containers for any particular premises or facility. By tabulating total number of container loads, the system keeps running figures on shipment volume within a premises. This data is then compared to known capacity values to evaluate and/or forecast facility utilization. One example of applicability of this aspect of the invention is to a land fill facility wherein containers are monitored by loads to continuously calculate remaining capacity of a land fill.

Associated with load status and container contents is data on part-carrying racks which fit inside containers. In certain applications of the system, monitoring of racks is equally or even more important than monitoring containers for the reason that certain parts cannot be carried in containers without specially adapted racks. For example, parts such as automobile engines cannot be shipped without empty racks being returned from an automobile assembly plant to an engine plant. Containers which hold such racks are therefore specially identified in the CMCS so that as such containers are completely unloaded, and empty racks placed back in the container, the container is specially identified as, for example, "racks outbound".

A container vehicle V or switcher S drops the container C in a receiving area Y outside or within facility boundaries B. The location of the initial drop off point is confirmed by communication from a remote container data transceiver 18 operated by personnel on the facility premises, such as a shunter driver, for immediate input to the
CMCS. This begins the pattern of constant and immediate updating of container location and status by the CMCS to the customer MIS which enables the customer MIS to locate shipments without any searching or delay. The customer provides instructions on which containers are needed at which docks, i.e., switching instructions. Switching instructions may be generated by the customer MIS and delivered to operators of the switchers S or transmitted to the CMCS for communication to switchers S via remote data transceivers 18. Switching instructions are carried out by operators of switchers S which, in the example of a trucking operation, hook-up to a container such as a trailer and move it from a receiving area to the specified dock. The terms "container" and "trailer" are used synonymously herein. The new location of the container is again

reported to the CMCS in the form of a dock or gate number for updating of data on that container in the CMCS database. The amount of time the container remains at the dock is counted in the running retention time clock.

Subsequent container switching instructions received from the facility, for example to remove a container from a dock and return it to a yard, are similarly conveyed and executed by switchers S and reported for updating the CMCS database.

The data of course includes the location of the container. Load status of a container is also updated according to information provided by the customer. For example, a container which is partially unloaded and then instructed to be returned to a receiving or holding area is noted in the system as a "partial load". The container is thus readily identifiable when instructed to be returned to continue unloading. In the instance where a single container is switched between a yard and dock or docks multiple times before leaving the premises, the system records each switching operation. This information is useful to the customer to identify excessive switching which indicates production or distribution process inefficiency. Because the system continuously tracks the location and status of all containers on the premises at all times, calculations can be made to determine available capacity for receiving additional containers. This includes calculations for one time deliveries such as to land fills.

Once a container is completely empty and returned to a yard, it is recorded in the
CMCS database and reported to the carrier as empty and ready for departure from the premises. In order to communicate all of the data acquired by the CMCS relative to container location and status, including arrival and retention times and load status, the system is able to generate reports of container activity in any desired format for the benefit of all customers and all carriers delivering containers to customers. For example, as represented by FIG. 3, a "Detail on Hand" report 100 may be generated by the CMCS in any particular format such as columns and rows in which carriers and containers are listed with accompanying status data such as date and time of arrival, yard location and load status. In column 1 are listed carrier identifications such as SCAT codes for trucks.

Column 2 identifies each carrier by full or abbreviated name. Column 3 lists the date of arrival of each container, and in column 4 is listed the time of arrival. In column 5 is listed the dock or docks at which a container is or was last unloaded. And in column 6 the current yard location of each container is listed. In column 7 is noted the status of the container load. which may include notations empty racks such as "racks outbound".

Column 8 lists the container number which corresponds to the carrier. And column 9 is provided for entry of load-specific data such as contents identification and quantities and any other load data as may be included on, for example, a master packing list. The load specific data is critical to customers who pay suppliers on a "paid-on-production" system whereby suppliers are paid only upon assembly of parts into a finished product. By knowing that a certain shipment of parts actually arrived at the plant, and that the container left the plant in an empty state, the system provides the customer with independent verification for authorization of payments to suppliers. The load specific data may further include data on racks in containers. Since a load of racks will have a freight bill identifying the number and type of racks and destination, all of this information can be readily input to the CMCS, and set forth in column 9 of the report, to expedite the return of empty racks to a parts production facility.

The report of FIG. 3 is organized by carrier over a period of calendar days.

Other report formats which the system may generate may be according to certain yards or receiving areas, times of arrival, unloading docks, container numbers for certain carriers, or load status. For example, report 120 as depicted in FIG. 4, is compiled as a verification of container data, and control menus for accessing different types of information on containers in the system.

The process begins at step 0, proceeding to step 100 to determine arrival of a container. Step 200 insures that each arriving container is uniquely identified by the system. FIGS. 6A-6C are representative of types of screen displays which may be generated by the CMCS computer program for input and display of container information at a CMCS monitor. For example, a screen display such as FIG. 6A provides a format for a container identification header to be created at step 300. The header is used as a virtual data envelope by and through which all data relevant to an identified container is accessible, transferable. manipulable. An arrival record is created at step 400. Step 500 is provided to accommodate containers which must be immediately "spotted" or moved to yard or dock, for example based upon information received from the customer MIS identifying "hot" loads. In lieu of an immediate spot, arriving containers are spotted to a yard at step 600 and the header record updated at step 700 with yard location, which may also include a subdesignation of a parking spot within a yard. FIG. 6B is a trailer spot update input screen display. At step 1000, loaded containers are summoned to a receiving dock, based upon instructions received from the customer, the header record for the summoned container located at step 1100 such as by inputting container identification via the input screen display of FIG. 6C, with intermediate error correction steps 1200 and 1300. and a container spot or transfer performed and similarly updated to the system at steps 600 and 700. Containers departing from the premises are monitored at step 1400 which again requires locating the corresponding header record at step 1500 via screen display of FIG. 6C, with error correction for no data match at steps 1600 and 1700, the departure of containers input and updated to the system at steps 1800 and 1900. By performing these steps in connection with the CMCS programmed to follow and prompt users through the sequence, and by controlling the plant entry points and premises, the system maintains accurate records of identification, location and load status of all containers on the premises and the amount of time containers are on the premises.

The invention further provides detailed information on dock usage and availability for a given facility. This information is very valuable to managers of the facility to enable analysis of dock usage, and to schedule incoming loads, particularly "hot" loads or live unloads which proceed from a gate directly to a dock for just-intime delivery, or to coordinate deliveries to arrive within a scheduled window of time.

Dock usage directly correlates to production or warehousing activity within a facility, because each dock is located nearest to

an assigned task within the facility. When a particular dock is occupied by a container, it is critical to know which is the next nearest available dock. As shown in FIG. 7A, the system produces a real-time Dock
Availability Report 701 which numerically lists each dock at a facility in columns 702, followed by carrier and container identification codes in columns 703. The
Report 701 is generated from the data received from drivers or the switching vehicles
S on containers dropped at a dock. The report 701 can be displayed within a switching vehicle on radio frequency operated hand held devices or on the display of an on-board computer.

By recording every container drop or move to every dock, the system can further generate various Dock Management Reports as shown in FIGS. 7B-7C. FIG. 7B is a Carrier
Dock Activity Report 710 which, for a given carrier, such as "LEHM" in field 711 on a given day, such as "12/04/97" in field 712, shows the total number of containers brought to a dock in field 713 and from where they came (e.g., from a yard, from another dock, or direct arrival); total number of containers removed from or left at docks in field 714, the load status of containers removed from docks in field 715. The load status may be partial, empty, empty racks or other such as a "live unload". The total number of different types or switches or movements of containers for the day are recorded in field 716.

As shown in FIG. 7C, the system further generates a specific dock activity report 720 for a particular dock and a particular carrier. The specific dock is identified in field 721. An "In Dock Time" field 722 records the date and time of arrival of a container at the dock. An "Exit Dock Time" field 723 records the date and time of departure of the container from the dock. A "Dwell Time" field 724 records the total time in minutes that the container was at the dock. A "Trailer" field 725 records the identification number of the container, which in this example is a trailer. And a "Carrier" field 726 identifies the carrier. Field 727 records the inbound and outbound load status. Field 728 records the identity of the origination and destination yards.

The dock activity report can assist the facility management by appropriate allocations of manpower to docks for unloading and loading operations.

FIG. 7D is a "live unload" report 730 which records all trailers which were taken directly to docks for unloading upon arrival at a facility. The live unload dock is identified in field 731. The "In Dock Time" is recorded in field 732, the "Exit
Dock Time" in field 733, the "Dwell Time" in field 734, the "Trailer" or container identifier in field 735, and "Carrier" identification in field 736. Report 730 assists the facility management in measuring the performance of carriers and logistics providers, as "live unloads" represent the most efficient delivery scenario in which the cargo arrives at a point or window in time in which it can be accepted directly into the facility.

From the report 720, a carrier knows exactly when its containers reached a dock and how long each container remained at a dock for unloading, and whether it was completely or partially unloaded. This information is used to compile a bill to the facility owner for over-retention of containers, in excess of an agreed amount of time allotted for unloading. The facility owner uses this report to confirm that bills for over-retention charges are accurate. The facility owner can also use this report to identify inefficiencies in unloading operations or inaccurate timing ofjust-in-time manufacturing operations. For example, if a particular dock or group of docks are more active than others, or occupied for longer times than others, it may indicate that more workers are needed at those docks to expedite unloading. The daily generation of reports 710 and 720 can be automatically faxed by the system to both carriers and facility management so that appropriate logistics adjustments can be made.

Alternatively, both carriers and a facility may access reports from the CMCS by appropriate connection, including via e-mail or the Internet, as described in connection with FIG. 2.

For managers of a facility where thousands of containers are arriving and departing each month, it is advantageous to have data on trends in container arrival.

This information is used to identify delivery windows, or to alter delivery logistics. It is especially useful for timing just-in-time deliveries. FIGS. 8A and 8B together are an example of an Arrival Count Report 801 which shows container arrivals by hour for each day of a month. The days of the month are listed in column 802. The hours for each day are listed in the columns 803 to the right of column 802. Total container arrivals are set forth on line 804, and the average number of container arrivals per hour on line 805. On FIG. 8B, field 806 sets forth total and average numbers of container arrivals for each day of the week for a specified month. Field 807 sets forth the total number of arrivals per hour, per day of each week for a specified month.

And field 808 sets forth in summary form the average number of arrivals per hour, per day of each week for a specified month.

The system also records total number of switches per hour per day, as shown by the "Switch Count Report" 901 in FIG. 9A. Column 902 lists the days of a specified month. Columns 903 are for each hour of the day, with totals in the far right column 904. The system operator can use this information to plan for staffing of switching vehicle operators, and to detail billing based on per switch or spot operations. In the "Switch Count Summary Reports", FIG. 9B, the system total number of switches per day of the week for a selected month in field 905, and average number of switches per day of the week for a selected month in field 906. The total number of switches per hour per day of the week is set forth in field 907, and the average number of switches per day per hour of the week in field 908.

The system also generates a "Live Unload Exception" report 1001, shown in
FIG. 1 or. Because the system knows from an advanced shipping notice (ASN) that a particular load is intended to be a "live unload", which means that the container is to be delivered directly to a dock without being first switched or placed in a yard or holding area, any contact with such a container by a switcher S of the system automatically records the container status as a "live unload exception". The carrier is identified in field 1002. The container is identified in field 1003. The date and time of

arrival is identified in field 1004. The date and time of the "First Move", the time the switcher S contacted the container which triggered its entry into the Live Unload
Exception report, is recorded in field 1005. The number of moves are recorded in field 1006. This could be several moves before the container is emptied. The date and time of departure is recorded in field 1007. And the load status is recorded in field 1008.

For any container which appears on the Live Unload Exception report 1001, a
Detail Page report 1010, shown in FIG. IOB is accessible. Field 1011 includes the carrier and container identifier, load status, the fact that it was originally intended to be a live load but resulted in a live unload exception, and the yard location. Field 1012 records the date and time of each of the events in connection with the excepted container, including the date and time of arrival, last move, immediate fax for notification to the carrier or container owner, retained or put into detention, unload, loading or partial loading of racks (commencement of loading), completed reload and departure. Field 1013 provides a running history of container activity including a record of the date, time, yard, dock, type (of load), arrival/departure (A/D).

Just as the information on dock availability is valuable, so is information on utilization of the various yards surrounding a facility. To this end, the system provides a "Slot Availability" reports as shown in FIGS. 1 IA-1 IF which provide realtime information on container identification within each (parking) slot in each yard monitored. FIG. 1 A is one graphic form of a yard slot availability report 1101, wherein various yards are identified in the left side column 1102, and yard slots across the upper line 1103. This creates a matrix in which a container location can be identified graphically, by for example the asterisk symbol. The corresponding detailed information on the selected container is displayed below in line 1104. Including the yard name. row and slot designation, carrier and container identification code, and load status.

Alternatively, as shown in FIG. 11B, a "Yard Selection Screen" 1106 lists yard identifiers in column 1107, and the yard names in column 1108. Selection of a yard identifier from column 1107 takes the user to a "Row Selection Screen" 1110 shown in FIG. 11 C. Selection of a row from column 1111 on screen 1110 takes the user to the "Slot Detail Screen" 1112 shown in FIG. 1 lid. Within a frame 1113 are designators 1114 for each of the slots (e.g., 1-20) within the selected row. Next to each of the slot designators 1114 are the carrier/container identifiers for the containers present in those slots. This procedure is most useful where the general location of a container is known. When the location of container is not known at all, a search function is provided on each of the screens 1106, 1110 and 1112. For example, by pressing F5, the user is taken to a "Find Trailer By Trailer Number" screen 1116 shown in FIG. IIE. A trailer number is entered and the system switches to a "Trailer
Quick Summary Screen" 1118 shown in FIG. 1 IF. Field 1120 of screen 1118 displays the load status of the container, the yard location, the row designation within the yard, the slot number within the row, and an identifier (e.g., KKS) of a driver of a switching vehicle which placed the container in that location. The identification of the switching vehicle driver is particularly advantageous to operators of the system, to be able to dispatch the correct driver to retrieve a container within the driver's assigned yards or rows. The "Trailer Quick Summary Screen" 1118 can also be accessed by selecting a highlighted trailer/container identifier on the "Slot Detail
Screen" 1112 of FIG. 11D. A user can move about the "Slot Detail Screen" 1112 by the use of cursor keys or a mouse.

Containers are commonly tracked in transit by satellites or other electronic signaling and tracking devices. In transit type tracking systems are macro in the sense that they know whether a container is at point A or at point B, or at a location between points A and B, but they do not know the location or load status of a container within point A or point B. Such information is critical to carriers to be able to time deliveries to coordinate with production, to know immediate availability of containers, to know the contents of returning containers such as "racks outbound", and to have enough information to compile a real-time/running accounting of a shipping business as further described below.

The use of radio frequency identification (RFID) tags and readers, as produced for example by SAMSYs, Inc., enables rapid acquisition and updating of container location and status. The equipment typically includes a card or tag on which is encoded carrier and container identification data. Tag or card readers are located at facility boundaries such as gate G, or in yards or at docks to automatically identify containers. This instantaneously loads the container location data into the CMCS 10 (FIG. 2). Automated container data input can alternatively be accomplished by the use of magnetically encoded cards and readers, or scannable bar code tags.

When the tag or card readers of a group or network of facilities are all electronically linked to the CMCS 10, a carrier MIS 40 which is linked to the CMCS can obtain a real-time location of every container which has been automatically read into the system. For example. a carrier or supplier connects to the CMCS by private or other connection such as through the World Wide Web. The user enters an ID number to gain access to the system. In one embodiment, the system generates a mapping screen 1200, shown in FIG. 12A, which displays a geographic territory which encompasses all or some of the carrier's terminals, and facilities at which containers are monitored. Field 1201 of screen 1200 is a container search input to locate a container at any one of the monitored sites. Once a container number is input, the system progresses to display the site at which the input container is presently located, such as screen 1205 shown in FIG. 12B, and in field 1206 displays the site location name, arrival date and time, and a request to view a history archive file. which may be displayed such as field 1013 of FIG. IOB. In other words, it provides an archival history of the specified container at the specified site, i.e., when it arrived, how many switch moves have been made, how many and which docks it has been at, and the load status between each switch move and the current load status.

The system uses a similar approach to perform container audits of selected facility or terminal sites. For example, as shown in FIG. 12C, a site display screen 1208 geographically displays each of the facility and/or terminal sites monitored by the system, and includes a site or terminal search field 1209. When the name of site is entered, the system progresses to screen 1210 shown in FIG. 12D, which displays in field 1212 a listing of all containers present at the selected site. A particular container can be selected from field 1212 for detailed archival data on that container in a form, for example, such as field 1013 of FIG. IOB. One item information which may be included in this field for any particular container is a note or comment on the maintenance status of a container. Since the switching vehicle operators and loaders/unloaders of the container have

ample opportunity to inspect each container handled, they can input any observed damage or maintenance requirement into a comment field in the container status. This enables a rolling maintenance program whereby a carrier can plan for delivery of a container to a maintenance facility based upon a known repair need. Of course, the container and site data can be alternatively displayed in different formats which may not include a graphical representation.

With the described real-time data on container location and load status acquired by the system, a user such as a carrier or supplier has enough information to derive a virtual inventory at each stage of a supply chain. As described with reference to FIGS. 13A-13D, the supply chain logistics tracking starts with a customer or consignee release of a product/part order at step 1301 in FIG. 13A. The supplier makes an internal check of inventory at step 1302, and goes to production steps 1303 and 1304 if production is required in order to establish supplier inventory at step 1305. A "Supplier" as identified in the boxes, may be either the original manufacturer of the goods specified in the release order at step 1301 or a distributor who physically receives goods from a manufacturer or represents a manufacturer as a sales agent and processes orders for the manufacturer. The supplier pulls product from inventory at step 1306 and loads it on a conveyance at step 1307.

An important piece of inherent data is created at this point with respect to shipping racks.

As known in the industry, the term "racks" refers to any type of packaging or support device which holds a part or multiple parts for secure shipment within a container. A rack may be something as simple as a carton, box or pallet, or a complex steel structure which supports an engine or other subassembly of a product. In most instances, products cannot be shipped without a specific corresponding rack..

The type and number of parts loaded for conveyance will indicate the type and number of racks required to be on the shipping container. Similarly, the number of parts can be calculated from part size, pallet size, box or carton size, whether the pallets, boxes, cartons are stackable, and the size of the container in which the parts are being carried. All such data may be resident in the CMCS database 12 (FIG. 2).

At step 1308 on FIG. 13B, the supplier generates an advanced shipping notice (ASN) for transmission to the customer. The ASN includes the part number, supplier code, release order, purchase order number, quantity shipped, destination and estimated time of arrival (ETA) at the consignee's or customer's facility. When the carrier departs from the supplier at step 1309 the shipment is noted as "in transit" at step 1310. The ASN is electronically transferred to the consignee/customer at step
13 11. The ASN is loaded into a virtual inventory database 13 in the CMCS (FIG. 2) at step 1312. Additional data resident in the virtual inventory database may include the location of the supplier and the a calculated ETA based on that location, associated carriers and type or size of containers, and rack information. This data
may be redundant, related or in addition to the data supplied by the ASN. The inventory is "virtual" in the sense that the CMCS knows that it is scheduled to become inventory prior to its physical arrival, as a result of receipt of the advance shipping notice (ASN). When the shipment physically arrives at the site at step 1314, the recording of the carrier and container ID as described above creates a "virtual inventory" record at step 1315. This inventory is "virtual" in the sense that although it is physically at a facility, i.e., in a container which is sitting in a yard or on a pier next to a building which is the assembly or transfer site, it is "near" inventory because it is not inside the building, or grouped together with like parts in a storage or assembly line spot, but is nonetheless accounted for by the system.

The physical arrival of a container at step 1314 is entered into the CMCS at step 1316 (FIG. 13C). By matching the conveyance arrival data (carrier and container
ID) with the ASN data received from the carrier, the CMCS performs a system-tosystem audit verification at step 1317, and is able to notify the customer/consignee of any discrepancies at step 1318. A carrier may query the CMCS virtual inventory 13 at step 1319 by entering the ASN data for a particular shipment. This prompts the system to search the virtual inventory ASN files for product match at step 1320, and to generate a conveyance report at step 1321 based upon accurate matches of ASN/virtual inventory data. Simultaneously, at step 1322, multiple conveyance product matches are converted to total product so that the consignee can be alerted to overstock and/or overshipment of product, and thereby reduce further purchase order or release from a blanket purchase order.

When the conveyance or container is unloaded at step 1323 (FIG. 13D) it becomes consignee/customer "in facility" inventory at step 1324. The unloading is noted by the switching operations described above. The system then purges the corresponding ASN once the container is noted as (fully) unloaded or reload status at step 1325. With the shipment completed, the system is able to produce a conveyance life cycle report at step 1326, and record the report in an archive at step 1327.

The advantage of the described virtual inventory aspect of the system is that it provides real-time data on all inventory regardless of its location, i.e., in transit at a facility, or in a facility. This is the only way to keep an accurate accounting of the total real time value of the supplier s, carrier's, business, and customer's businesses.

The virtual inventory aspect of the invention is thus a method to assist a customer's management in inventory control. The customer can "view" all inventory(whether physically in stock or not) less all inventory committed to production or delivery as "real inventory". Customer savings are realized from inventory reductions (i.e., a reduction of carrying costs including interest, insurance and taxes), the possible elimination of offsite storage facilities, or the need to rent or build additional space, potential reduction in required warehouse space and the associated costs, and avoidance of safety issues involved with warehousing of excess inventory, including insurance, worker's compensation and related litigation.

The ordinary payment procedure of customers, such as automobile manufacturers, is to pay for parts delivered only upon proof of receipt. The proof of receipt is ordinarily a bill of lading which accompanies the shipment. A bill of lading is a receipt which a carrier gives to a supplier/shipper for goods given to the carrier for delivery. The bill of lading evidences the contract between the shipper/supplier and the carrier, and can also serve as a document of title creating in the person possessing the

bill ownership of the goods shipped. The bill of lading is ordinarily presented to the customer upon delivery of the shipment by the carrier. This procedure is complicated by the following circumstances, a) where the container is left at the customer's yard for some period oftime before it is unloaded, b) where the customer and supplier agree that payment for the goods will not be made until the goods are unloaded (completely) into the customer's facility, or c) where the carrier must return the container with racks which belong to the customer or the supplier. Of particular importance is the information on "racks outbound" (RO) from a facility, as this impacts directly on the future flow of parts to the facility.

Complex paper-based systems have been devised to confirm receipt and unloading of goods, and reloading of racks (correct in number and type) into returning containers. However, any misplacement or oversight of any of the documents required to record the each of the necessary actions to be taken with any given container corrupts the system and ultimately results in a) a loss in inventory to the customer, or b) substantial extra expense to the supplier to correct errors in rack returns. A supplier is just as interested in receiving back the correct type and number of racks as is the customer in receiving the correct type and number of parts. For without the correct racks, a supplier can deliver no more parts.

The present invention provides an improved method and system for verifying and document accurate rack return without total reliance on a multiple copy paper chain. As described with reference to FIGS. 14A-14C, at step 1401 a facility worker such as a lift driver reloads an emptied container such as a trailer with returnable racks. A rack return reload sheet (RRRS) is filled out at step 1402. The rack return reload sheet is based on MMDT and a rack ID matrix acquired at step 1403, and a dock number, SCAC code, trailer number, rack identifier and quantity acquired at step 1404. The rack reload sheet is faxed to the facility gate G (FIG. 2) at step 1405 for entry into the CMCS database at step 1406 and verified at step 1407. The rack return reload sheet data is also fed to the customer MIS 12 at step 1408 and "booked" for payment at step 1409. The data from the rack return reload sheet is loaded into the
CMCS at step 1410. The CMCS then matches the data to the MMDT rack ID matrix data resident in the database at step 1411. If this information matches then the system produces an electronic bill (of lading) at step 1412 for matching with the corresponding container as it leaves the facility boundaries through the gate. This electronic bill of lading is also transferred to the customer MIS 30 or 60 at step 1413 to provide that system with the latest rack return data. Rather than relying on the carrier's bill of lading and rack return information, the system has generated a bill based upon information received from the person who reloaded the container with empty racks, and cross-checked that information with the MMDT and rack ID data.

With reference to FIG. 14B, as a rack-carrying container arrives at the facility gate, the container number is entered into the system (manually or automatically) at step 1414. The system notifies the operator at step 1415 that the container is "racks outbound" and asks if an outbound billing memo (i.e., a bill of lading) is to be printed.

If the billing memo is requested at step 1416, the system, knowing the return destination of the racks, automatically calculates at step 1417 an estimated time of arrival (ETA) based upon data on mileage average speed, DOT regulations supplier business hours, plus an "X" hours buffer time. All of this information is calculated from data resident in the CMCS database. The request for an outbound billing memo at step 1415 updates the container to "depart" status at step 1418, and the billing memo data is automatically faxed to the carrier at step 1419, and to the supplier at step 1420, with the calculated ETA. A hardcopy of the billing memo is printed at the gate at step 1421 and handed to the carrier driver at step 1422. The container departs at step 1423, and the customer's record of rack return is updated with the actual time and date of departure at step 1424.

As shown in FIG. 14C, the detailed tracking of rack returns continues all the way back to the supplier. If the carrier driver meets the calculated ETA, at step 1425, the supplier "arrives" the container at step 1428 by notifying the CMCS, electronically or by telephone. If the container does not ar bulk quantities which exceed present production requirements and are therefore simply held within the manufacturing facility. This commonly results in substantial losses of excess small parts waiting for assembly. In one particular industry, this "holding" of parts and the resultant losses is estimated to add 15% to the total cost of the parts.

The present invention eliminates the asynchronous delivery of small parts to a manufacturing facility relative to current production by providing a metered warehouse from which small parts are distributed to the manufacturing facility in quantities which correspond to current (daily and weekly) production. As shown in
FIG. 15, a metering warehouse 1500 receives parts from standard parts manufacturers 1502 delivered by carriers 1504. The carriers 1504 used by the system are preferably closely affiliated with the manufacturers of the standard parts, with establish "most efficient routes" from the manufacturers 1502 to the warehouse 1500. The warehouse 1500 is preferably in relatively close proximity to a manufacturing facility 1506 where the standard parts will be assembled into a finished product or component.

The warehouse 1500 may have on hand a minimum quantity of standard parts for manufacture of a certain product, based on current trends in manufactunng pace and capacity. Many warehouses are operated under inventory management programs which adjust inventory based upon projected requirements. Although such systems reduce overstocking of parts they do not address the manufacturer's problem that arises from the delivery of a minimum quantity, such as a carton, to the facility, when only one box of parts from the carton will be used in the day's or week' s production.

The losses to the manufacturer occur with the parts remaining in the carton, awaiting assembly.

In the present invention, when the warehouse 1500 receives a build order from the manufacturing facility, specifying the exact number of parts required for a production run. A "metered" load 1508 is assembled at the warehouse and delivered to the facility 1506 by metered parts conveyance 1510. The metered load may include an exact quantity of parts required for production for a single or multiple shifts, one day, several days, a week or several weeks or more. Records of the metered load are matched to the build orders. Within the manufacturing assembly there are assembly zones, e.g., Zone A. Zone B, Zone C, etc. The metered load 1508 is loaded onto the parts conveyance 15 10 according to a sequence in which the zones at the facility will be reached. This aspect of the system is critical in connection with a manufacturing facility which may be

many acres in size, with substantial distances between drop-off points (docks) to the different zones. The load 1508 is dropped at the designated zones in sequence. The timing of the metered load delivery can be matched to a production schedule to accomplish just-in-time delivery. The deliveries are communicated to the manufacturing facility, e.g. through the CMCS, so that the facility has a running record of parts on hand. Each of the zones is then audited periodically to verify that the current zone parts inventory corresponds with completed production runs.

The invention has been described in terms of certain preferred and alternate embodiments which are representative of only some of the various ways in which the basic concepts of the invention may be implemented. Certain modifications or variations on the implementation of the inventive concepts which may occur to those of ordinary skill in the art are within the scope of the invention and equivalents, as defined by the accompanying claims.

Last updated: 26.04.2011 Worldwide Database 5.7.22; 93p

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Claims: JP 2002501000 (T)

CONTAINER AND INVENTORY MONITORING METHODS AND SYSTEMS

Claims not available for JP 2002501000 (T)
Claims of corresponding document: WO 9938136 (A2)

Translate this text Claims tree

CLAIMS
What is claimed is: 1. A system for monitoring and recording location and load status of shipping containers relative to a facility with an associated yard defined by a boundary within which containers are to be monitored by the system, and a controlled entry point to the boundary, the system comprising:
means for recording identification codes of containers which enter the boundary,
means for communicating and recording information on movements, location and load status of containers within the boundary in response to movement and changes in location and load status of containers made according to instructions received from the facility,
means for generating reports of recorded information on locations and load status of containers within the boundary, and
means for generating reports on container locations and load status relative to designated docks associated with a facility.

2. The system of claim 1 wherein the reports on container locations and load status relative to designated docks associated with a facility are presented as dock availability reports which list a plurality of dock designations and an identification code of a container associated with a designated dock.

3. The system of claim 1 wherein movements of containers within the boundary are recorded in the form of a carrier dock activity report which displays a number of containers located at a dock of a facility during a designated day, a starting point of a container prior to arriving at a dock, a load status of the container as it was removed from a dock, and a number of switches of container during the designated day.

4. The system of claim 1 wherein movements of containers within the boundary are recorded in the form of a dock activity report which for a designated dock on a designated day records an identity of a container brought to the dock, an inbound load status of the container and an outbound load status of the container, an in dock time and an exit dock time, and a dock dwell time.

5. The system of claim 1 wherein movements of containers within the boundary are recorded in the form of a live unload report which records the date, time, dwell time and identification of containers which move from an entry point of the boundary to a dock..

6. The system of claim 1 wherein movements of containers within a boundary are recorded in the form of an arrival count report which records a total number of containers arrived to a facility per a specified time period.

7. The system of claim 6 wherein the arrival count report records a total number of containers arrived to a facility per day.

8. The system of claim 6 wherein the arrival count report records an average number of containers arrived to a facility per day.

9. The system of claim 6 wherein the arrival count report records a total number of containers arrived to a facility per hour.

10. The system of claim 6 wherein the arrival count report records an average number of containers arrived to a facility per hour.

11. The system of claim 6 wherein the arrival count report records an average number of containers arrived to a facility per hour per a twenty-four hour period.

12. The system of claim 1 wherein the arrival count report records a total number of containers arrived to a facility per hour per day.

13. The system of claim 1 wherein the arrival count report records an average number of containers arrived to a facility per hour per day.

14. The system of claim 1 wherein movements of containers within a boundary are recorded in the form of a switch count report which records a total number of container switches per a specified period of time.

15. The system of claim 14 wherein the switch count report includes a total number of switches per day.

16. The system of claim 14 wherein the switch count report includes an average number of switches per day.

17. The system of claim 14 wherein the switch count report includes an total number of switches per hour per day.

18. The system of claim 14 wherein the switch count report includes an average number of switches per hour per day.

19. The system of claim 1 wherein movements of containers within a boundary are recorded in the form of a live unload exception report which records a container identification, date and time of arrival, date and time of first move, number of moves, date and time of departure, and load status.

20. The system of claim 19 wherein the live unload exception report further comprises a detail page report which includes an archival history of switching and load status of a designated container.

Last updated: 26.04.2011 Worldwide Database 5.7.22; 93p